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ABSTRACT

Since publication of the Coleman Report, the belief has become increasingly pervasive that formal education does not or cannot make a difference in what a student learns--that patterns of academic performance are immutably molded by social and economic conditions outside the school. The purpose of this paper is to present a comprehensive review and analysis of 19 school effectiveness studies. The four-section paper (1) attempts to place contemporary assessment efforts in historical perspective; (2) discusses the nature and limitations of such studies; (3) presents a study-by-study review of recent efforts to examine systematically the impact of school variables upon student performance; and (4) summarizes the school service components which were consistently found to be significantly associated with one or more measures of pupil performance (i.e., the number and quality of professional staff, particularly teachers; contact frequency with professional staff; adequacy and extent of physical facilities for instruction; and expenditures per pupil and teacher). The amount and consistency of evidence supporting the effectiveness of school services in influencing academic performance lead to the conclusion that although there is a need for more precise information about which components are most effective and in what mix or proportion they can be made more effective, there can be little doubt that schools do make a difference. (Also included: a summary chart which condenses the essential components of each investigation and a 38-item list of references.) (JES)

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A SURVEY OF SCHOOL EFFECTIVENESS STUDIES*

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by

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In a nation where more than a quarter of the total population is annually enrolled in schools, it borders on the heretical to contend that formal education does not or cannot make a difference in what a student learns. Nevertheless, for many interested laymen and educators, and some researchers, the so-called Coleman Report has provoked just such a heresy. Whether they gained their perception of school ineffectiveness from actually reading the "Report" or acquired it second hand through an interpreter or medium is a good question. Regardless, the fact remains that since publication of Equality of Educational Opportunity[1] the belief has become increasingly pervasive that patterns of academic performance are immutably molded by social and economic conditions outside the school. If incorrect, and if allowed to persist unexamined and unchallenged, this belief could have wildly disabling consequences. It is not at all difficult to foresee how it could become self-fulfilling; administrators and teachers believing that their school and schoolroom actions make no difference might begin to behave accordingly. Conversely, if the assertion is correct but allowed to pass unheeded, the prospect of pouring even more billions of local, state, and federal dollars down an ineffective rathole labelled "schools" is equally unsettling.

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*This paper is adapted from Chapter Four of Schools and Inequality, a study conducted by the authors in 1969 for the Urban Coalition.

[1]Coleman, James S., et al., Equality of Educational Opportunity (Washington, D. C.: U. S. Government Printing Office, 1966).

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The purpose of this paper is neither to solicit salvation for unabashed advocates of more schooling nor to grant grace to school critics and cynics. Rather, our intent is to provoke more sophisticated discussion regarding school effectiveness than has frequently been the case in the past. Our tactic in pursuing such an objective is to present a comprehensive review and analysis of school effectiveness studies, many of which have been conducted in the time since publication of the Survey of Equal Educational Opportunity. We begin this presentation by attempting to place contemporary assessment efforts in histroical perspective. Following that, we discuss the theoretical, more accurately, "non-theoretical" nature of such studies. The remainder of the paper is concerned with a study-by-study review of recent efforts to examine systematically the impact of school variables upon student performance.

Historical Perspective

For many years, at least since public schooling became an endeavor involving many millions of dollars, laymen, educators, and researchers have been interested in making the enterprise more effective, and hopefully more efficient. This concern has been reflected in a large number of research studies dealing with school effectiveness. Early efforts were conducted for the most part by professional educators. This work is probably best characterized by the "cost-quality studies" of the late Paul R. Mort of Teachers College, Columbia University.[2] The general

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[2]A review of the cost-quality line of inquiry and some of its successors is provided by William E. Barron's chapter, "Measurement of Educational Productivity," in The Theory and Practice of School Finance, edited by Warren E. Gauerke and Jack R. Childress (Chicago: Rand McNally Co., 1967), pp. 279-308. An earlier review of such efforts is provided in Mort, Paul R., "Cost Quality Relationships in Education," Problems and

mode of these studies was to use per pupil expenditure levels as gross measures of the quality of a school. The "outputs" of schools were measures on a number of dimensions. In some of the better studies, the dollar inputs were related to actual measures of pupil performance. In other studies, assessment of school effects stopped short of pupil performance measures and took instead some process variable such as the rate at which the schools adopted innovative instructional practices or new curricula.[3] The studies rather consistently concluded that those districts which spent more dollars per pupil were the most "effective," their students performed the best on test scores, attended college more frequently, etc. These findings provide a strong case for increasing school expenditures if one desires higher levels of student performance.

The simplified cost-quality studies, however, contain a serious deficiency. They do not take into sufficient account the student's capabilities prior to entry into the school or the type of experiences he participates in outside of school. In short, such studies do not control adequately for the background and environment of the pupil. What their findings tend to demonstrate is that the high expenditure districts, the Scarsdales, Grosse Pointes, and Palo Altos of this nation, produce large numbers of high performance students. However, given the nature of the social millieu from which these students typically come, the level of education of their parents, the efforts frequently spent in their

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[2](cont.) Issues in Public School Finance, edited by R. L. Johns and Edgar L. Morphet (New York: National Conference of Professors of Educational Administration, 1952).

[3]See, for example, Furno, Orlando Frederick, "The Projection of School Quality from Expenditure Level" (unpublished doctoral disseration, Columbia University, 1956).

homes to prepare them for school, and the many cultural and educational advantages they have by virtue of their community setting, it would be surprising indeed if such high expenditure schools did not produce highly capable students.

In time the above-described weaknesses of the cost-quality type of research became evident, and a new line of inquiry began. This time, the primary actors were those trained in methods of sociological research. The findings of these researchers, best illustrated perhaps in studies conducted by Alan B. Wilson and James S.Coleman,[4] tend to emphasize the significance of the student's social context, rather than school services, as determinants of pupil performance.

The general tenor of such sociological studies has been to demonstrate that a student's achievement is tied very tightly to his socio-economic status. For example, in Equality of Educational Opportunity, differences were reported between ethnic groups as to their "sensitivity" to the effects of school quality.[5] On balance, however, in the view of Coleman and his fellow authors, the school service variables succeeded in explaining such a small portion of the variation in pupils' performance that they were moved to write:

> Taking all these results together, one implication stands out above all: That schools bring little

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[4]In this context, one can take, for example, either the Coleman Report to which we have already referred or an earlier study by the same author, "The Adolescent Subculture and Academic Achievement," The American Journal of Sociology, Volume 65 (1960), pp. 337-347. An excellent example of Wilson's research is "Residential Segregation of Social Classes and Aspirations of High School Boys," American Sociological Review, Volume 24 (1959), pp. 836-845.

[5]Negroes, Indian-Americans, Mexican-Americans, and Puerto Ricans tended to respond more dramatically to contact with good teachers and enriched programs than did white students.

> influence to bear upon a child's achievement that is independent of his background and general social context; and that this very lack of independent effect means that the inequalities imposed upon children by their home, neighborhood, and peer environment are carried along to become the inequalities with which they confront adult life at the end of school.[6]

Critics of the Coleman Report hold that this conclusion is not necessarily warranted.[7] Their criticisms are at three levels: (1) inadequacy of the measurements utilized, (2) imprecise manipulation of those measures, and (3) inappropriate statistical techniques. Criticism one is exemplified by the Report's measures of school facilities, volumes-per-student in the school library and (for grades 9-12) the presence or absence of science laboratories. The critics' contention is that so few and such simple measures are insufficient in any attempt to understand the significance of the school in explaining pupil performance.

Criticism number two is exemplified by the treatment accorded the statistic "instructional expenditures per pupil." Each student was assumed by the Report to be benefiting from an annual instructional expenditure equal to the mean for his school district. The use of such an average masks intradistrict disparities, and from evidence displayed elsewhere in the Report such disparities appear to be substantial. By averaging expenditures and curtailing their distribution, the Report weighted the data against the possibility of finding a significant relationship.

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[6] Equality of Educational Opportunity, p. 325.

[7] For a more detailed explanation of the limitations of Coleman Report findings, see Bowles, Samuel S. and Levin, Henry M., "The Determinants of Scholastic Achievement: An Appraisal of Some Recent Findings," Journal of Human Resources, Volume III, No. 1 (Winter 1968). Also, see "More on Multicollinearity and the Effectiveness of Schools," Journal of Human Resources, Volume 3, No. 5 (Summer 1968), by the same authors.

The third major criticism involves the Report's statistical analyses. The issue here is that the Report's authors employed a form of regression analysis which is inappropriate if there exists a high degree of intercorrelation among "independent" variables. The Coleman Report attempted to explain variance in achievement scores by adding successively different independent variables to the analysis. The outcomes of this approach are highly sensitive to the order in which the explanatory variables are entered whenever the explanatory variables are interrelated.

The critics argue that Report measures of socioeconomic conditions and school services are highly interrelated and do not meet the criterion of independence. The argument here is that high quality school services tend to be made available to students from higher socioeconomic strata and lower quality school services to students from low socioeconomic strata.[8] If in a regression analysis "independent" variables are in fact highly intercorrelated, whichever variable cluster (socioeconomic status or school services) is first placed in the equation will have the highest explanatory power. The first entered cluster will have exhausted the major portion of whatever variance exists to be explained by the total of the two variable clusters together. The analysis involved in the Coleman Report chose to place socioeconomic status variables into the equation first; not unexpectedly they "discovered" that this cluster explained substantially more variance than did the school service cluster. Had they reversed the entry position of the two clusters, they would have found schools to be the major contributor to pupil performance.[9]

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[8] Strong evidence for this proposition is provided in the research reported in Chapter Three of Schools and Inequality.

[9] Bowles and Levin, op. cit.

Studies which have emphasized, or overemphasized, the influence of social environment at the expense of school services, if taken on their face, have the effect of discounting the significance of schooling. At the other extreme, the cost-quality type study has frequently been over-simplified and construed to mean that schools will solve the problems of low pupil performance if only we spend more money. Clearly, in order to assess the determinants of intellectual achievement, or any other kind of student performance, adequate account must be taken of both the social context enveloping the student and the character of the school services to which he is exposed. Ideally, such an assessment should be of a "value added" nature. That is, we should like to determine what the child "knew" before he came to school, what he "knew" when he completed school, and how much of the difference was the unique contribution of the school. In order to conduct such an ideal study, the researcher would need to control methodologically for the possible influence of a host of out-of-school factors such as the student's innate intellectual capacity, family and home background, and neighborhood environment. Obviously, such total experimentation is presently impossible. Nevertheless, in this paper, we review research studies in which insofar as possible an attempt has been made to avoid the failings of past research in an effort to come closer to the "true" effects of schools upon student performance.[10]

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[10]For further elaboration upon the difficulties inherent in assessing the effects of schools see Werts, Charles E. and Linn, Robert L., "Analyzing School Effects: How to Use the Same Data to Support Different Hypotheses," American Educational Research Journal, Volume VI, Number 3 (May 1969), pp. 439-447.

A Perspective on Schooling

Before launching into research findings regarding the effects of various school services upon measures of pupil achievement, it seems appropriate to step back for a moment and attempt to gain a reasoned view of what it is that schools do and what it is that effects what schools do. Nowhere is it defined with precision, but schools in American society are expected to transform pupils on a large number of dimensions. A wide variety of attitudes, skills, and knowledge are expected to be "packed" into each pupil as a consequence of going to school. We do not yet understand well what mechanisms inside the human body enable one to "learn" these things. We do know, however, that whatever the process, or processes, they are extraordinarily complex. We can see this when we witness the wide range of ways in which children typically respond to the same events and stimuli. Children comprehend and express that comprehension in different ways, at different rates, and to varying degrees.

Whatever schools do to enchance this comprehension depends in a very major way upon the student's ability to perceive, store, process, and respond to a wide variety of environmental inputs. We do not, at least at this point, wish to become embroiled in what appears to be a specious argument as to whether this cluster of abilities is more sensitive to biological or environmental influences.[11] Suffice it here to say simply that almost all of the typical individual's biologically

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[11] See, for example, the article by Jensen, Arthur R., "How Much can We Boost IQ and Scholastic Achievement?" Harvard Educational Review, Volume 39, No. 1 (Winter 1969), and the critical reactions to it in the subsequent issue, Volume 39, No. 2 (Spring 1969).

inherited components and a very substantial share of those which are environmentally shaped have taken hold prior to his first experiences with any formal education. Now, once having acknowledged the potential influence of genes and out-of-school environment, it seems reasonable to assume that the scope of variation in human performance which remains for the school to affect uniquely is somewhat limited. Moreover, it must be remembered that schools do not occupy the entire span of even the most ardent student's time. Even on a school day, and these frequently take up less than one-half of all the days in a year, a student is likely to be in the company and under the influence of his peers and parents for a longer period of time than he is engaged in school activities. Nevertheless, it still seems reasonable to expect the schools to have an effect; indeed, we will soon describe some of these effects.

But What Part of "School" Makes a Difference?

The term "school" is a deceptive generic label. Webster's New World Dictionary contains no less than ten different contemporary definitions.[12] An etymological approach scarcely provides more precision. At its Latin roots, "school" refers to leisure, or the manner and location in which leisure took place. The difficulty with this ambiguity is that it complicates our desire to assess the "difference" that "school" makes. Only the most naive could possibly believe that the sheer act of being physically present in some building labeled SCHOOL renders an individual knowledgeable or skilled. Presumably, some sort of pedagogical process must be undergone before educational objectives are met. But

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[12] Webster's New World Dictionary of the American Language, College Edition (New York: World Publishing Company, 1966), p. 1304.

just what are these processes? Where is it in the little "black box" labeled school that we should look. Is it the edifice itself? Is it the blackboards, the teacher, the textbooks, the movie projector, or the principal? Is it all of these things, or is it something else again.

In this quest, we are reminded of the frequent admonition: "Get the facts!" All right, but what facts? Facts about what? What "facts" are relevant? Without some systematic theoretical guidance, the researcher must resort to an almost random inquiry to isolate the essential ingredients. The plight is not quite this bad, we are able to resort to logic and prior research findings in order to identify school service components worthy of being tested for effectiveness. Nevertheless, the quest would be greatly aided if we had a body of theory, theory about learning and instruction, which could guide us. Psychologists are daily discovering more about the nature of the learning process. We are perhaps still a long way from a unified theory of learning, but bits and pieces of such a theory are beginning to fall into place. What is not yet evolving very rapidly is a theory of instruction.[13] An analogy with the practice of medicine may be helpful in understanding the difference. To have a theory or body of knowledge which explains the origin of some particular disease is crucial to, but by itself insufficient for, treating a patient with that disease. Given knowledge that the patient has cancer, do you treat the illness with drugs, surgery, or radiation? This answer, of course, must rest upon the traits of the individual

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[13] The need for a theory of instruction is forcefully explained in an article by Nathan L. Gage entitled "Theories of Teaching" in Theories of Learning and Instruction, The Sixty-Third Yearbook of the National Society for the Study of Education (Chicago: University of Chicago Press, 1964), pp. 268-285.

patient, the location and type of the cancer, the therapeutic processes at hand, and the skill of the physician. Much the same relationship holds between a learning theory which explains the processes which underly reading and a teaching theory which would explain how to manipulate the environment to take advantage of the processes which "cause" one to be able to read. We are beginning to know moderately well the neurological and psychological mechanisms which interact to enable one to read. What we are just beginning to investigate is the means by which we can intervene in and manipulate those processes in the instance of individuals to make readers out of them. Given the biological and environmentally induced differences between individuals, the "treatment" for reading disabilities may well turn out to be complicated several fold over the techniques necessary to treat cancer.

In the absence of a theory of instruction, educational researchers have typically tended to construct typologies of logically ordered school service components and to use available empirical measures to represent each of the typology categories. This is the general procedure followed in the research we will review. We do not wish to apologize for this nontheoretical approach or to bemoan ad nauseum the lack of an instructional theory. The point here is simply that research strategies based on "raw" empiricism are comparatively inefficient, and the continued lack of an instructional theory will hamper efforts to identify the sine qua non, the crucial instructional components, of schools.

Inability to construct a unified theory of instruction, however, has not been the only factor deterring identification of effective school service components. Another significant inhibitor of this quest has

been the relatively slow development of research strategies and measurement methodologies applicable to education. Measures of output tend to be narrow; that is, they typically consist of a single performance criterion, for example, students' scores on various kinds of standardized achievement tests. Moreover, information about inputs is also frequently limited. The limitation here is that only a very few school systems collect information on any sizeable number of significant input dimensions; and, even where such an effort is made, interdistrict comparisons are frequently frustrated by the lack of standardization in the data collected. Despite such handicaps, an increasing body of sophisticated research is accumulating on the effectiveness of various school service components, and we begin our review of such studies at this point. However, the reader who desires only a summary of this information can move directly to page 35 where we present a condensed version of these findings.

Research Findings

One of the forerunners in educational input-output analysis is a little known, but nevertheless significant, study done in 1956 for the Educational Testing Service by William G. Mollenkopf and S. Donald Melville.[14] These researchers gathered aptitude and achievement test scores from a nationwide sample of 9,000 ninth grade students in 100 schools and 8,357 twelfth grade students in 106 schools. Principals in each school responded to a questionnaire which led to the construction of 34 variables dealing with socioeconomic characteristics of students

[14]Mollenkopf, William G. and Melville, S. Donald, "A Study of Secondary School Characteristics as Related to Test Scores," Research Bulletin 56-6 (Princeton: Educational Testing Service, 1956), mimeograph.

and their parents, availability of community provided educational opportunities, and quality of available school services. Given these three clusters of variables, the authors were able to assess the school's contribution to student performance while attempting to control for out-of-school influences. The authors are particularly careful to caution readers of the difficulty in prohibiting student socioeconomic factors from contaminating any analysis of school service effects. Nevertheless, after controlling as best they could for student SES, they report four school service measures to be significantly related to pupil achievement. These are (1) number of special staff (psychologists, reading specialists, counselors, etc.) in the school, (2) class size, (3) pupil-teacher ratio,[15] and (4) instructional expenditures per student.

All of these findings suggest the central importance of the school staff and of students having relatively frequent contact with that staff. Measure number four is somewhat difficult to interpret because instructional expenditures usually include funds for supplies and equipment as well as staff salaries. However, in that the overwhelming proportion of this expenditure category is typically spent on instructional salaries, this measure also hints of the significance of the school's personnel in the learning of students. What is necessary now is to compare the results obtained in this study with those obtained in investigations where the controls for out-of-school influences are more adequate.

Another one of the early studies in this field was conducted in 1959

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[15]The second and third measures (class size and pupil-teacher ratio) represent similar but not identical phenomena. For example, it is possible for a school to have a relatively high ratio of pupils to teachers, but if each teacher instructs in six or more classes, average class size may be relatively low. In general, however, where class size is large there will be relatively few staff members for the number of students enrolled.

by the New York State Department of Education under the direction of Samuel M. Goodman.[16] This study, known as the Quality Measurement Project, covered a sample of 70,000 seventh and eleventh grade students in 102 school districts selected for their ability to represent all of New York State. Findings here are comparable on two dimensions with the work of Mollenkopf-Melville. After partialling out the variance accounted for by the socioeconomic status of parents, Goodman reports per pupil instructional expenditures and number of special staff per 1,000 students to be significantly correlated with the achievement test scores of seventh grade students. In addition, two other characteristics were found to be significantly linked to pupil performance; they are teachers' experience and a variable described as "classroom atmosphere." Teacher experience was measured as number of teachers in a district with five or more years of employment as a classroom instructor. "Classroom atmosphere" was a measure resulting from an observer's rating of the degree to which the teacher attempted to relate the subject matter under consideration to the interests and ability levels of students. In essence, it appears to be a measure of the degree to which the teacher was student oriented as contrasted with what educators frequently term "subject matter oriented." In general, Goodman's findings again point to the importance of the school's personnel in the instructional process.

J. Alan Thomas, in 1962, utilized Project TALENT information to test the impact of a large number of home, community, and school service variables upon student performance.[17] His sample was composed of 206 high

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[16] Goodman, Samuel M., The Assessment of School Quality (Albany: The State Education Department of New York, 1959).

[17] Thomas, J. Alan, "Efficiency in Education: A Study of the Relationship between Selected Inputs and Mean Test Scores in a Sample of Senior High Schools," unpublished Ph.D. dissertation (Stanford University: School of Education, 1962).

schools in communities of 2,500 to 25,000 in 46 states. For tenth and twelfth grade students in these schools he had scores on eighteen separate achievement tests. Data about students, communities, and schools were taken from Project TALENT surveys and the 1960 census. Regression analysis was the statistical treatment utilized, and three measures of school service were found to be significantly related with students' test scores, after taking home and community factors into account. These school service components are: (1) beginning teachers' salaries, (2) teachers' experience, and (3) number of volumes in the school library.

A unique examination of school effectiveness took place in 1964. It is not within the same analytical stream as the other studies we present, but it nevertheless warrants description. In the spring of 1959 the Board of Education in Prince Edward County, Virginia, voted to close all public schools under its authority. This action was taken in an effort to avoid the Supreme Court's racial desegregation decree. Thereafter, most white students in the County attended a segregated private school. Negro children, and a few poor whites, had several options: attend school in another county, participate in an assortment of volunteer efforts and makeshift schools, or forego formal education altogether. An inadvertent outcome of the school board's racist decision was to create some of the conditions necessary for an experimental analysis of school effectiveness. A team of Michigan State University researchers directed by Robert L. Green seized the opportunity.[18]

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[18]Green, Robert Lee, et al., "The Educational Status of Children in a District Without Public Schools," Bureau of Educational Research Services, College of Education, Michigan State University, Department of Health, Education and Welfare, Office of Education Cooperative Research Project No. 2321, 1964.

Significant differences were found in the home background and socio-economic status of those children who attended schools outside the county. Thus they were excluded from comparison. However, no such out-of-school differences were found for those children who did and who did not participate in the within county volunteer schools. Participatants and non-participants were administered standardized tests (Metropolitan Readiness and Stanford Achievement). Mean test scores were higher in almost every age group for those students who had participated in the intensive, formal, volunteer schooling programs. However, test score increments for age groups 6 to 10, though statistically significant, were minimal. For age groups 11 to 17, the gains were statistically significant and substantial.

A difficulty which arises in attempting to interpret this research is that the character of the educational services under study is imprecisely described and measured. Only the most gross kind of statement can be made: "Those children who attended the intensive volunteer educational program scored higher than those who did not." We do not know the nature of the educational program, and to that extent we are hampered in discovering the dimensions of schooling which account for learning.

Two significant studies of the effects of schools were reported in 1965: one, centered on schools in New York, was done by Herbert J. Kiesling[19] and the other, centered on schools in California was done for

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[19]Kiesling's study was an unpublished Harvard University Ph.D. dissertation. The results of that study are more readily available in an article entitled "Measuring a Local Government Service: A Study of School Districts in New York State," Review of Economics and Statistics, Volume XLIX, No. 3 (August 1967), pp. 356-367.

the California State Senate by Charles S. Benson.[20] The Benson study utilized data on fifth grade students from 249 school districts. Student performance was measured by standardized reading and mathematics tests. Data were compiled from the 1960 census on 12 socioeconomic and demographic variables of school district residents. Information was gathered from school districts and official state-wide reports on 18 variables relating to school finance and expenditure allocations for school services. Because of a lack of time and the condition of the data, the study utilized only entire school districts, not individual schools, as the unit of analysis. Consequently, because of the averaging which occurs when measures for an entire district are used, the findings contain the potential to understate the importance of school service variables. Nevertheless, stepwise multiple regression analysis revealed teachers' salaries and instructional expenditures per pupil to be positively related to pupils' achievement even when socioeconomic status variables were taken into account. In Benson's words:

> The association between the achievement of pupils and the instruction offered by these teachers who are qualified by experience and training to be paid in the upper salary quartile is positive, and the association stands independently of the known connection between the home environment of pupils and their achievement.[21]

For medium-sized school districts (those with enrollments of 2,000 to 4,500 pupils) Benson found that, in addition to variables relating to teachers' salaries, mean salary of administrators was also positively

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[20] Benson, Charles S., et al., State and Local Fiscal Relationships in Public Education in California, a report of the Senate Fact Finding Committee on Revenue and Taxation published by the Senate of the State of California, March, 1965.

[21] Ibid., p. 56.

associated with student achievement. Thus, from yet another study, we have strong evidence to suggest the importance of staff members with certain characteristics in influencing the performance of pupils.

The study of Kiesling utilized information collected in the previously described New York State Quality Measurement Project conducted by Goodman. One of Kiesling's major findings is that expenditures per pupil are positively related to student achievement (measured on Iowa Tests of Basic Skills and Iowa Tests of Educational Development). This finding holds specifically for large school districts (those with enrollments in excess of 2,000 pupils), particularly large urban school districts containing relatively large proportions of disadvantaged students. For small districts, particularly small rural districts, the relationship between these two factors was frequently found to be random, and in some instances even to be negative. However, as the author is careful to suggest, the opportunity for various kinds of measurement idiosyncracies to manifest themselves is substantially greater in small districts. In a research sample composed of school districts which contain small numbers of students and very few teachers, the characteristics of individuals at the extremes of the measurement scales take on statistical significance out of proportion to their number. Moreover, as was the case with the Benson study, the per pupil expenditure variable used by Kiesling was a district-wide average figure and thus contains the potential to distort significantly the amount of resources spent on any individual student within a specific district. Nevertheless, one of the study's findings deserves particular emphasis. In Kiesling's words:

> The relationship of expenditure to performance in large urban districts is quite strong, with an

> additional $100 of expenditure being associated with 2.6 months of [achievement] at the beginning of the expenditure range and 1.4 months at the end of the range.[22]

In that the total per pupil expenditure figure for a school district represents money spent for a wide range of products and services, it is impossible to state precisely from Kiesling's findings just what school service component or components are making the difference. One extrapolation which appears reasonable, however, stems from the fact that the overwhelming portion of most school district's expenditures are for the salary of professional staff. (This figure typically accounts for from 65 to 85 percent of a school district's budget.) Consequently, it might be that the higher expenditure figure represents an ability to purchase services of instructional personnel who are more effective by virtue of their experience, preparation, and general ability. These increments in the quality of staff, in turn, reflect themselves in the achievement test scores of students. This is but a supposition, however, because Kiesling does not present data directly related to teacher preparation and experience.

Results of the study Equality of Educational Opportunity (the Coleman Report) were made public in 1966. At the beginning of this paper we noted the limitations of the Coleman team's efforts. At this point it is appropriate also to acknowledge some of the Report's strengths. The Coleman Report represents the most extensive attempt at assessment of a nation's entire educational system ever made. The survey collected

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[22]Kiesling, op. cit., p. 365. The word "achievement" in this quotation is ours. The journal article has the word "expenditure" at that exact point, but the meaningless nature of the term in that context leads us to believe that it is a printing error and that our substitution is consistent with the author's intent.

information on approximately 660,000 students attending thousands of schools in hundreds of school districts in every region of the United States. In addition, data were gathered regarding the teachers of those students, the characteristics of their schools, the range and diversity of their curriculums, qualifications of the school administrators, and so on. Because of serious measurement errors and inappropriate analytical procedures, we believe that Coleman and his colleagues, though unintentionally, underestimate the potential significance for pupil achievement of a number of the school service components they examined. Nevertheless, a fact which is worthy of emphasis is that, even having biased their analysis against finding effective school service components, the Coleman team does report several such components to be positively and significantly associated with pupils' performance.[23]

The most significant school service variable in explaining student achievement (measured by a vocabulary test) was a teacher characteristic, the teacher's verbal ability. As with the other findings of this nature that we have discussed, care must be used in interpreting the meaning of such a result. What the Coleman team reports is that, after having made an effort to control statistically for a student's home background and community social environment, his achievement test results tend to increase in relation to the verbal ability level of his teacher. Obviously,

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[23]The analyses of the effect of school service components upon pupil performance is discussed in the Coleman Report from page 290 - 332. In addition to the already cited works by Bowles and Levin, anyone who is deeply interested in studies of school effectiveness should read Cain, Glen and Watts, Harold, "Problems in Making Inferences from the Coleman Report," mimeographed working paper of the Institute for Research on Poverty (Madison: University of Wisconsin, 1968), and Kain, John F. and Hanushek, Eric A., "On the Value of Equality of Educational Opportunity as a Guide to Public Policy," mimeographed working paper #36 of the Program on Regional and Urban Economics (Cambridge: Harvard University, 1968).

much more is involved in the instruction of a student than his teacher's skill at responding to verbal ability test questions. However, if one views teachers' verbal ability as a proxy measure for a number of related skills and qualities, the Coleman Report finding can be interpreted in a meaningful fashion.[24] If the measure of verbal ability is taken to represent the general intelligence level of the teacher, the finding can be construed to mean that an intellectually facile instructor is more adept at tasks such as finding means to motivate students, adapting materials to their ability levels, and communicating in ways which make the subject matter more understandable. This is an interpretation which is totally consistent with the observations and conventional wisdom of untold thousands who have themselves been teachers or who have supervised teachers.

An interesting adjunct to the Coleman finding about teachers' verbal ability is that the variable appears to have an accumulative effect. It is statistically significant when examined for sixth grade students and thereafter increases in importance when examined for ninth and twelfth grade students. Moreover, its effect tends to vary in accord with the characteristics of the student. It shows consistently positive correlations with the achievement of all students, but it appears to be especially important in explaining the achievement levels of Negro students. To paraphrase the Coleman Report, Negro children appear to respond in a particularly sensitive and positive fashion to a teacher who is skilled verbally.

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[24]For additional information on the relationship of verbal ability to other personal attributes, see Flanagan, John C., et al., The American High School Student (Pittsburgh: Project TALENT office, University of Pittsburgh, 1964), Chapters 7 and 8.

In the year following issuance of the Coleman Report (1967), three additional studies were published which deal with some facet of the topic of school service effectiveness. Two of these, a study by Marion F. Shaycoft[25] and a study directed by Jesse Burkhead[26] focus on U. S. secondary schools. The third study, the so-called Plowden Report,[27] was conducted in England.

The Shaycoft study is unusually informative on several dimensions and somewhat disappointing on some others. Its greatest asset results from the procedures employed to measure student performance. The study sample consisted of 6,583 students who were tested by Project TALENT in 1960 when they were in the ninth grade. Subsequently, these students matriculated to 118 different secondary schools (101 of which were comprehensive high schools, the other 17 were specialized vocational high schools).[28] In 1963 this same cohort of students was administered a battery of examinations designed for twelfth grade students. The test battery, in addition to having the usual generalized tests of verbal and quantitative reasoning ability, also included achievement examinations

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[25]Shaycoft, Marion F., The High School Years: Growth in Cognitive Skills (Pittsburgh: American Institute for Research and School of Education, University of Pittsburgh, 1967).

[26]Burkhead, Jesse, Fox, Thomas G. and Holland, John W., Input and Output in Large City High Schools (Syracuse: Syracuse University Press, 1967).

[27]This study represents the efforts of a distinguished committee chaired by Lady Plowden. The research study and report were issued by the Central Advisory Council on Education and are officially entitled Children and Their Primary Schools (London: Her Majesty's Stationery Office, 1967).

[28]The secondary schools were selected on the basis of a stratification procedure which aimed at constructing a sample which was representative of all secondary schools in the nation.

in specific subject areas, e.g., foreign language, English, accounting, and literature. Presumably, schools are established to instruct students in moderately well defined subject matter areas, not to increase some quality as amorphous as "verbal ability." Consequently, the Shaycoft output measures appear to be more related than those of most studies to the unique functions and objectives of schools.

A second favorable feature of the Shaycoft study is the use of longitudinal or time series testing. What a student knew about a particular subject was measured in grade nine, and this information was used as a baseline against which to assess increments in achievement for the subsequent three years of schooling. This procedure, more closely than most other methods, enables the researcher to gain a picture of the "value added" to the student during the course of his schooling. Moreover, in that the tests were heavily concentrated on school-related subjects, subjects about which one typically does not learn outside of schools, the room for alternative explanations of achievement gains is reduced.

The Shaycoft analyses reveal student achievement gains over the three years to be consistent and of a healthy magnitude. In most instances, twlefth grade achievement gains represented a difference of one standard deviation when compared to ninth grade norms. This is so even when differences in students' socioeconomic status are controlled statistically. It is reasonable to infer from such a finding that for the schools in question some school service characteristics are influencing student achievement. The difficulty, and consequently the disappointment, with the Shaycoft study, is that only a very limited spectrum of school service components was examined. The study concentrated on the

availability within schools of particular subject matter offerings. No measures of components such as staff quality, instructional material availability, or equipment and facility adequacy were employed. What can be said is that the availability of a particular curriculum in a school is related significantly to whether or not students grew in knowledge about the subject matter contained in that curriculum. Not surprisingly, for example, when schools did not offer courses in accounting or electricity, then students' scores on achievement tests in these areas were limited.

The effort by Burkhead and his colleagues lacks the richness of the Shaycoft study on the dimension of subject matter output measures, but it is much more complete in terms of the school service components it examines. The Burkhead study sample included 39 Chicago public secondary schools (enrolling almost 90 thousand students), and 22 Atlanta public high schools (enrolling a total of approximately 19 thousand students). Results for schools in these two large cities were compared with data from a Project TALENT sample of approximately 180 public high schools in smaller communities. Information regarding students' performance was constructed from scores on a variety of tests of aptitude, reading and general knowledge and measures of school persistence (the degree to which students do <u>not</u> "drop out" of schools). Socioeconomic status measures were derived from 1960 census data about residents in high school attendance areas. School service components consisted of measures such as teacher-man-years per pupil, teachers' experience, and school building age. Statistical techniques were employed in an effort to control for the SES of students. Unfortunately, however, these

statistical procedures were essentially the same as those employed by the Coleman Report team, and, thus, tend to understate seriously the potential impact of school service components. Nevertheless, as with the Coleman Report, despite methodological limitations biasing the findings against schools, Burkhead reports some school services to be effective.

Findings varied somewhat from Chicago to Atlanta, probably, at least in part, reflecting the lack of standardization in the input and output measures available for schools in the two cities. Moreover, results from analyses of Chicago's schools were somewhat hampered by lack of variation or dispersion in the quality of school services dispensed at the different schools. Nevertheless, in Chicago, newer buildings were found to be associated with lower dropout rates and the teacher's experience was linked to pupils' reading scores. For Atlanta schools, low rates of teacher turnover were found to be positively associated with increments in pupils' scores on tests of verbal ability. For the sample of high schools in small communities, the beginning salary and years of experience for teachers and the age of the school building were found to explain variations in test score results.

The previously referred to work of England's Central Advisory Council on Education (The Plowden Report) consists of two volumes, Volume I presents the policy recommendations of the Council and Volume II contains results of the several research studies which serve to support these recommendations.[29] For our purposes, the Plowden Report's most

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[29]A discussion and critique of both volumes is provided in separate articles by Joseph Featherstone and David Cohen in the Harvard Educational Review, Volume 38, No. 2 (Spring 1968), pp. 317-340.

significant research study is the National Survey of Parental Attitudes and Circumstances Related to School and Pupil Characteristics, directed by Gerald Peaker. This effort collected information from a stratified random sample of primary school students as to academic performance and school and home characteristics. These data enabled the study team to assess the relative influence upon pupil performance of home and socio-economic status characteristics and school service components. The primary statistical procedure employed was regression analysis.

Except for the fact that the study limits itself to a concern for elementary school students, its findings and the controversies surrounding them are not very different from those which have accompanied the Coleman Report in this nation. Nevertheless, several school service components are described as contributing in a statistically significant fashion to an explanation of pupil achievement. These components deal with the school building and the teacher. Specifically, age of building and teacher's experience, academic preparation, and "ability" were found to be positively associated with output measures. These findings are all consistent with and support the results of the several other studies we have already reviewed.

Added evidence of the significant role played by teachers in the instructional process is provided in a 1968 study by Elchanan Cohn.[30] As an economist, Cohn was primarily concerned with examining possible economies of scale in public high school operations. His analyses, however, also lend themselves to our search for information about the effectiveness of various school service components. For secondary school

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[30]Cohn, Elchanan, "Economies of Scale in Iowa High School Operations," Journal of Human Resources, Volume 3, No. 4 (Fall 1968), pp. 422-434.

students in a sample of 377 school districts in the State of Iowa, Cohn obtained information relative to achievement (as measured by scores on the Iowa Test of Educational Development) and school services (mostly expenditure data and information about teacher characteristics). Using multiple regression analysis, Cohn reports that amount of teacher salary and number of instructional assignments per teacher are associated with increments of pupil achievement, and the direction of the association is in keeping with conventional expectations. The higher the salary and the fewer the number of different teaching assignments for a teacher, the higher the test scores of pupils. In terms of his primary objective, assessing economies of scale, Cohn found high schools with enrollments between approximately 1,250 and 1,650 students to be the most cost-effective.

The extent to which Cohn's study utilized an effective statistical control for certain non-school inputs (student aptitude and SES) is questionable. Consequently, the results in terms of the unique contribution of school services must be interpreted with caution. Nevertheless, Cohn's findings are consistent with what we have come to expect by comparison with findings from other studies.

A study somewhat similar to Cohn's was reported in 1968 by Richard Raymond.[31] Raymond's sample consisted of approximately 5,000 West Virginia high school students who graduated between 1963 and 1966 and who subsequently matriculated to the University of West Virginia. The freshman year performance of these students was measured by achievement

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[31] Raymond, Richard, "Determinants of the Quality of Primary and Secondary Public Education in West Virginia," Journal of Human Resources, Volume 3, No. 4 (Fall 1968), pp. 450-470.

test scores and individual grade point averages. Students were grouped by the county in which their high school was located, and measures of school service characteristics were then obtained for county school systems.[32] Four measures of socioeconomic status for the residents of these counties were obtained from 1960 census data. Using these census figures to control for SES, Raymond regressed school service components on the two output measures and found teachers' salaries to explain a significant portion of the variance in students' freshman year scholastic performance. The salaries of elementary school teachers appeared to be particularly powerful variables in explaining differences in student achievement.

A portion of the 1968 study of Boston schools done by Martin Katzman examines the relationship between school services and student achievement.[33] He collected data from 56 of the Boston school system's elementary school attendance districts. Information was gathered on six dimensions of pupil performance: three measures having to do with regularity of attendance and school holding power and three scholastic measures (percentage of students taking and percentage passing the entrance examination to the city's academically elite Latin High School, and reading achievement increments as determined by differentials between second and sixth grade examination results).

Using multiple regression analysis in an effort to control for students' SES, Katzman found school service variables to be significantly associated with one or more of the above output measures in the following fashion:

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[32] As with most southern states, in West Virginia the county serves as the primary unit for organizing local school districts.

[33] Katzman, Theodore Martin, "Distribution and Production in a Big City Elementary School System," Yale Economic Essays, Volume 8, No. 1 (Spring 1968), pp. 201-256.

A measure of "crowding" was derived from the number of classrooms which contained more than 35 students. That figure represented the modal number of desks in Boston city school's classrooms; students in excess of this number were taken to be in some sort of makeshift arrangement. The consequences of crowding were not found to be clear and consistent on the attendance output measures. Non-crowding, however, was associated with increments of reading achievement and number of students passing the Latin High School's entrance examination.

The ratio of students to staff members was found to have consistent and significant correlation with school attendance and school persistence output measures.

The size of the attendance district appeared to provide some economies of scale when judged on the output criteria of reading scores and school persistence. That is, the larger the number of children served by an attendance district, the higher their reading achievement increments and the greater the schools' holding power. However, in contrast to these positive consequences of size, some diseconomies of scale were found when the output measures dealt with the Latin High School. The larger the attendance district's enrollments, the smaller the proportion of students who sat for and passed the Latin High School's entrance examination.

The percentage of permanently employed teachers was found to have minor, but nevertheless positive, effects on all output measures. The greater the percentage of permanently employed teachers, tenured teachers, the better the performance of pupils.

Percent of teachers who possessed a masters degree was found to have

generally positive effects. This component demonstrated particularly strong relationships with measures of school attendance.

The percent of teachers in an attendance district with from one to ten years of teaching experience was taken as a school service component or input variable. The relationship of this measure to outputs was interesting, but inconsistent. Experience was positively associated with measures of school attendance and holding power, but negatively related to relative increments in reading achievement.

The turnover rate among teachers within an attendance district was demonstrated to have a slight negative association with all the output measures.

Katzman's study adds substantially to the evidence supporting the significant role of school staff in effecting pupil performance. As with almost all such efforts, however, the findings of his study would be even more helpful had he been able to enlarge the scope and refine the input measures considered. The finding for teacher experience provides an interesting example here. To know that the variable "percent of teachers with from 1 to 10 years of teaching experience" is positively linked to increments in holding power, but negatively associated with relative increments of reading achievement is to paint a somewhat perplexing picture. If Katzman had had access to detailed information, we could begin to see more precisely whether these findings result from very new, inexperienced teachers, say in their first year, or teachers near the nine and ten year end of the category.

In 1968, Samuel Bowles presented preliminary results of another

study on educational production functions.[34] Bowles' findings are based on a sample of 12th grade Negro male students constructed from data compiled by the Coleman Report survey team. Bowles is careful to circumscribe the validity and generalizability of his findings by referring to the limitations of the sampling and measurement procedures employed in the initial collection of the data. Despite these limitations, we find his results to be of interest; not only do they reaffirm the significance of teacher characteristics, but also they suggest certain additional categories of school service components to be important. Regression analysis was employed, and four measures of a student's home environment were entered into the equation in an effort to control for out-of-school influences. The relative presence of science laboratory facilities, the average amount of time a teacher spends in guidance activities, and the number of days the school stays in session during a school year are all variables found to be significantly associated with students' scores on tests of verbal ability. The "science teaching laboratory" variable is somewhat similar to "teacher's verbal score" in that it needs to be interpreted. How can the presence or absence of science laboratories have an impact on student achievement when the latter is measured by general tests of reading and vocabulary? Our answer to this query is to take science laboratories as a proxy measure of school facilities more generally. The logic here is that schools possessing such laboratory facilities are also likely to be relatively well supplied on most other dimensions of school facilities. Conversely, a school lacking science

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[34]Bowles, Samuel S., "Towards and Educational Production Function," mimeographed paper presented at the Conference on Research in Income and Wealth (November 1968). (To be published in a forthcoming volume entitled Income and Education, edited by W. Lee Hansen.)

laboratories is also likely to be in a poor position with regard to other facilities used for instruction.

In another place, Bowles reports findings from a study which utilized a sample of twelfth grade Negro students for which Project TALENT information was available.[35] In this instance, the output measures were students' achievement in mathematics and reading and scores on a test of generalized academic ability. Bowles found large class size and "teaching" or ability grouping to be negatively related and amount of teachers' graduate preparation to be positively related to students' performance on reading tests. Only the class size variable was significant at the .05 level, however. When mathematics achievement scores were taken as the criterion, ability grouping and age of school building appeared to have a negative influence and expenditures per pupil and teachers' graduate preparation a positive influence. Finally, on the test of general academic ability, class size and ability grouping were again found to be negatively related and teacher preparation level positive. All of these findings came about after statistical controls for students' social environment had been exercised.

In another study, coauthored with Henry Levin, Bowles presents more findings about the effectiveness of several other school service components.[36] During the course of their literary debate with James S. Coleman and his colleagues regarding the validity of findings presented in

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[35] Bowles, Samuel S., "Educational Production Functions," Final Report to the Office of Education under cooperative research contract OEC 1-7-00451-2651 (February 1969), (see especially the tables on pp. 61-63).

[36] Bowles, Samuel S. and Levin, Henry M., "More on Multicollinearity and the Effectiveness of Schools," Journal of Human Resources, Volume 3, No. 3 (Summer 1968), pp. 393-400.

Equality of Educational Opportunity, Bowles and Levin employed EEOS data in a regression analysis which attempted to correct for some of the Coleman Report's controversial methodological procedures. These analyses were conducted using verbal ability test results as output measures for twelfth grade Negro students. In this effort, they found teachers' salaries and science laboratories to be significantly related to pupil performance. In another regression analysis in the same study, they found teachers' verbal ability to be significantly related to student achievement. These same findings held generally for analyses done for white twelfth grade students, but, for reasons which are not readily explainable, the levels of significance were lower.

Somewhat similar findings stem from a 1968 study done by Eric Hanushek.[37] This study attempts to calculate educational production functions for sixth grade children using standardized achievement test scores as a criterion of output and measures derived from Coleman Report data as inputs. The study centers on white children in 471 elementary schools and Negro children in 242 elementary schools in the metropolitan North. Regression analysis was the statistical procedure utilized with suitable controls for socioeconomic status. Significant relationships to achievement were found for teachers' verbal ability and years of teaching experience.

Also in 1968, Thomas I. Ribich published the results of a study utilizing information from Project TALENT.[38] Ribich's procedure was to

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[37]Hanushek, Eric, "The Education of Negroes and Whites," unpublished doctoral dissertation (Department of Economics, Massachusetts Institute of Technology, 1968).

[38]Ribich, Thomas I., Education and Poverty (Washington, D. C.: Brookings Institution, 1968).

examine only those students who fell into the lowest quintile on measures of socioeconomic status. When this control was exercised for out-of-school influences, it was found that pupils' performance on standardized achievement tests was directly related to expenditures per pupil.

In 1969, Guthrie and his colleagues conducted an assessment of school effectiveness using data collected in Michigan for the Equal Educational Opportunity Survey.[39] In an effort to avoid the methodological problems previously described for the Coleman Report findings on school effectiveness, a different analytical technique was employed. The sample consisted of 5,284 sixth grade students, both Negro and white. A socioeconomic status score for each student was computed from information regarding parental income and education. These scores were hierarchically ordered and subsequently divided into ten equal groups. Each decile subset contained approximately 528 students who were relatively homogeneous with regard to their social background. Separate analyses were then conducted for each decile in order to assess the relationship between measures of school service quality and student scores on tests of reading ability, mathematics understanding, and verbal facility.

In these analyses, a total of eleven school service variables were found to relate significantly to students' performance measures. The school service variables are listed below by category.

School Facilities	Teacher Characteristics
a. School site size	a. Verbal ability
b. Building age	b. Experience
c. Percent of makeshift classrooms	c. Job satisfaction

[39]Reported in Schools and Inequality and to be described in detail in a paper prepared for the American Educational Research Association Annual Meeting in Minneapolis, March 2-5, 1970.

Instructional Materials

a. Library volumes per student
b. Supply of textbooks

Student Environment

a. School size (enrollment)
b. Classrooms per 1,000 students
c. Percent of students transferring

Summary of Effective School Service Components

In the preceding section we reviewed nineteen studies which deal with the effectiveness of school service components. These investigations have been conducted using a variety of sample subjects, input and output measures, and controls for what are commonly presumed to be out-of-school influences upon pupil performance. In order to impose some degree of uniformity upon this diversity, we have attempted to condense the essential components of each investigation into a summary chart (Table 1 following p. 36).

From an inspection of these digested results it is evident that there is a substantial degree of consistency in the studies' findings. The strongest findings by far are those which relate to the number and quality of the professional staff, particularly teachers. Fifteen of the studies we review find teacher characteristics, such as verbal ability, amount of experience, salary level, amount and type of academic preparation, degree level, job satisfaction, and employment status (tenured or non-tenured), to be significantly associated with one or more measures of pupil performance.

In order for school staff to have an effect upon students, however, it is necessary that students have physical access to such persons. And, indeed, we also find that student performance is related to some degree

to contact frequency with or proximity to professional staff. This factor expresses itself in variables such as student-staff ratios, classroom size, school or school district size, and length of school year.

In addition to findings in support of the effectiveness of staff, a number of studies under review also present results to suggest that service components such as age of school building, adequacy and extent of physical facilities for instruction also are significantly linked to increments in scales of pupil performance. Finally, as might be expected logically because all the foregoing components translate into dollar costs, we find that measures such as expenditures per pupil and teachers' salary levels correlate significantly with pupil achievement measures.[40]

Conclusion

In conclusion, we are impressed with the amount and consistency of evidence supporting the effectiveness of school services in influencing the academic performance of pupils. In time, we would wish for more precise information about which school service components are most effective and in what mix or proportion they can be made more effective. Nevertheless, on the basis of information obtained in the studies we review, there can be little doubt that school do make a difference.

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[40] For a more detailed description of the manner in which teacher quality characteristics translate into dollar costs, see Levin, Henry M., Recruiting Teachers for Large City Schools (New York: Charles Merrill and Sons, 1970).

Table 1

Summary of Effectiveness Studies
on School Service Components

Study Author(s)	Description of Sample	Measure of Pupil Performance (School Output)	Measure(s) of Effective School Service Component(s) (School Input)
1. Mollenkopf and Melville	U.S., 17,000 9th (in 100 schools) and 12th (in 106 schools) grade, male & female	Aptitude and Achievement Tests	1. Number of special staff 2. Class size 3. Pupil-teacher ratio 4. Instructional expenditures
2. Goodman	New York, 70,000 7th & 11th grade, male & female in 102 school districts	Achievement Test	1. Number of special staff 2. Instructional expenditures 3. Teachers' experience 4. "Classroom atmosphere"
3. Thomas	Project TALENT Sample (national) 10th & 12th grade, male & female	Achievement Test	1. Teachers' salaries 2. Teachers' experience 3. Number of library books
4. Green, et al.	Virginia (Primarily Negro) Secondary students	Stanford Achievement Test	1. Aggregate measure of entire instructional program

5. Benson	California 5th grade, 249 school districts	Reading Achievement Test	1. Teachers' salaries 2. Administrators' salaries 3. Instructional expenditures
6. Kiesling	New York, 70,000 7th & 11th grade male & female in 102 school districts	Achievement Test	1. Expenditure per pupil (in large school districts)
7. Coleman Report	U. S. sample	Verbal Ability Test	1. Teachers' verbal ability
8. Shaycoft	U. S. 108 schools 6,500 9th & 12th grade, male & female	Battery of 42 Aptitude & Achievement Tests	1. Curriculum variables
9. Burkhead	90,000 Chicago High School students in 39 schools. 19,000 Atlanta High School students in 22 schools & 180 small community high schools	Aptitude & Achievement Tests & School Holding Power	1. Age of building 2. Teachers' experience 3. Teacher turnover 4. Teachers' salary
10. Plowden Report	English Elementary School students		1. Age of building 2. Teachers' experience 3. Teachers' academic preparation 4. Teachers' "ability"

11. Cohn	Iowa High School students in 377 school districts	Achievement Test	1. Teachers' salary 2. Number of instructional assignments per teacher 3. School size
12. Raymond	W. Virginia 5,000 high school students	Freshman Year (College) GPA & Achievement Test Scores	1. Teachers' salary
13. Katzman	Boston Elementary School students	School Attendance, School Holding Power, Reading Achievement, Special School Entrance Examination	1. Pupils per classroom 2. Student-staff ratio 3. Attendance district enrollment size 4. Teachers' employment status 5. Teachers' degree level 6. Teachers' experience 7. Teacher turnover ratio
14. Bowles (1)	U.S. 12th grade Negro males	Verbal Ability Test	1. Teachers' verbal ability 2. Science laboratory facilities 3. Length of school year
15. Bowles (2)	U.S. 12th grade Negro males	Mathematics & Reading Achievement Test and a test of general academic ability	1. Class size 2. Ability grouping 3. Level of teacher training 4. Age of school building 5. Expenditures per pupil

16. Bowles & Levin	12th grade Negro students & 12th grade white students	Verbal Ability Test Scores	1. Teachers' verbal ability 2. Teachers' salary
17. Hanushek	6th grade white students in 471 schools & 6th grade Negro students in 242 schools	Verbal Ability Test	1. Teachers' verbal ability 2. Teachers' experience
18. Ribich	Project TALENT Sample	Achievement Test	1. Expenditures per pupil
19. Guthrie, et al.	5,284 6th grade students in Michigan	Reading ability, Mathematics unverstanding, Verbal facility	1. School site size 2. Building age 3. % classrooms makeshift 4. Library volumes 5. Textbook supply 6. Teachers' verbal ability 7. Teachers' experience 8. Teachers' job satisfaction 9. School size (enrollment) 10. Classrooms per 1,000 students 11. % of students transferring

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